Mecklenburg County Park and Recreation
Natural Resources

2017 Resource and Land Management Plan

Mecklenburg County Park and Recreation
Division of Nature Preserves and Natural Resources
Natural Resources Section

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Chapter 1: Introduction

Since 1993, Mecklenburg County Park and Recreation (MCPR) Division of Nature Preserves and Natural Resources, Natural Resource Section (NRS) has been responsible for the conservation and management of natural communities within its parks and particularly nature preserves. NRS is responsible for enhancing biodiversity and protecting the greater Charlotte Region's water resources through sound land management. NRS funding is generated through Mecklenburg County property taxes, grants, donations, and timber receipts.

Mission and Vision

The Division's mission as stated in the Department's Master Plan, is to protect the region's biodiversity and natural heritage for its inherent value and for the benefit of future generations by promoting open space preservation, conserving natural communities, and fostering awareness and stewardship through environmental education and outdoor recreation. The vision is for natural communities to exist within Mecklenburg County in perpetuity and for these interconnected high-quality natural areas to benefit and be valued by all citizens.

NRS is the principal government agency responsible for the protection, conservation, and management of biological resources and natural areas on all lands owned by Mecklenburg County, as well as lands owned by the City of Charlotte with which management agreements are in place. While it is not an exhaustive guide for all NRS responsibilities, this plan provides background and guidance for the management of natural resources that Mecklenburg County owns and protects, with a particular focus on properties designated as nature preserve.

Management Themes

NRS has developed three broad themes for the management plan of Mecklenburg County Nature Preserves (NPs) meant to address both our mission and varied objectives.

1) Restore and Maintain Natural Communities- "A natural community is an interacting assemblage of organisms, their physical environment, and the natural processes that affect them." (Thompson and Sorenson, 2000). The management of NPs will be based on the concept of natural communities. The Classification of The Natural Communities of North Carolina Fourth Approximation (CNCNC) has delineated "communities whose characteristics and functioning are shaped by the processes of evolution and ecological interactions of long periods of time, without the overriding influence of modern human activities." (Schafale and Weakley, 1990). What makes the concept of natural communities so useful is that the individual communities, as described within the CNCNC, provide examples of how different assemblages of organisms will develop over time, across environmental gradients, in the absence of human intervention. With this understanding we may gain greater insight as to how our resource use and management affects ecological function and resiliency.

As natural resource managers, we are not as concerned with making areas more "natural" as we are with endorsing the development of natural community components that are necessary to maintain long-term ecological integrity. Managing for ecological integrity assumes the "conservation of viable populations of native species, maintenance of natural disturbance regimes, reintroduction of native, extirpated species and the representation of ecosystems across natural ranges of variation." (Grumbine,

1994). NRS aims to gradually establish these natural community components through long-term management and to conserve these characteristics where they are already present.

2) Fill Information Gaps through research, inventory and monitoring- Gather additional information and fill knowledge gaps to advance our understanding of natural communities, their species and natural processes. Use this information and sound scientific method to set landscape goals and guide management activities.

3) Conserve Soil and Water Resources- Much of the County's nature preserve system was purchased for watershed protection and management. A study in 2002 showed that for every 10 percent of intact forested watershed, chemical and treatment costs of drinking water decreased 20 percent (Ernst, 2004). were reduced by Soil structure and productivity may be heavily influenced by land management and recreational uses. All management activities will be designed to protect organic and mineral soil components, particularly the organic soil horizon, and allow for natural levels of nutrient cycling.

As stated in the Mecklenburg County Soil Erosion and Sedimentation Control Ordinance, non-point source pollution in the form of sedimentation is the primary threat to water quality in the county and especially on NPs. It is essential that accelerated erosion from recreation use and land management activities is prevented where possible and controlled where it occurs.

Chapter 2: Resource Conditions and Goals

Theme 1 – Restoring and Maintaining Natural Communities-This theme will address the management of vegetation for the development of specific natural community attributes and wildlife habitat components.

Vegetation - Historical and Existing Conditions
NRS is charged with restoring natural communities and native habitat to reflect our best understanding of natural conditions, as defined in CNCNC, Carolina Vegetation Survey reports and other supporting documents. Information regarding plant species at each nature preserve and throughout the County may be accessed at MeckFlora.MecklenburgCountyNC.gov.

The primary challenge when developing management prescriptions for ecosystem restoration is identifying the target historical condition of the various ecosystems given thousands of years of disturbance and change. Early written accounts of the North Carolina Piedmont describe the general character of the region at the time of European settlement but lack exactitude in their descriptions. They may be most useful in understanding the desired condition of grassland and prairie areas (Barden, 1997). The North Carolina Geological Survey publication, "Timber Trees and Forests of North Carolina" (Pinchot and Ashe, 1897) provides a primary source regarding the condition of forestland across the state at the turn of the twentieth century, after landscape-level impacts from European colonization. Mature forests in Mecklenburg County were described as "consisting of compact-growing hardwoods, oaks and hickories, with pine disseminated only on rocky or sandy soils along the crests of hills." In old fields, Eastern red cedar and Virginia and shortleaf pine dominated. Most areas of the piedmont were already second growth at this time, and dry areas consisted of black oak, white oak, and post oak. Northern red oak, yellow-poplar and white ash grew more readily on lower slopes. Dogwood was a commonly mentioned understory species. In most recently disturbed areas, shortleaf pine was common

as cattle chose to graze on other species and leave pine alone. Fires were said to have "seldom occurrence".

Today, most of Mecklenburg County's nature preserve forests are second or third growth, are not contiguous, and are lacking in age and structural diversity. One of NR's primary goals is to provide healthy forests through biological diversity, and this includes providing a variety of forest stages, from old field to climax. Changes in forest conditions are monitored in NR's forest assessment program, where trees and invasive species are inventoried on a 10-year rotation. This program began in 2004 and helps guide management decision-making as well as evaluate management successes and failures.

Vegetation- Goals and Desired Conditions

VEG-1: Preserves will be managed for structural and biological diversity so they are resilient against widespread invasive species, insect and disease occurrence.
VEG-2: Forest-wide structural diversity will be enhanced through the establishment of canopy gaps and the perpetuation of a variety of successional stages.
VEG-3: The spread and establishment of non-native invasive plant species will be controlled through systematic inventory, treatment, and monitoring processes.
VEG-4: Loblolly pine plantations will be managed for the purposes of increasing species and structural diversity so that they may more closely resemble the natural community type appropriate for the site.
VEG-5: Prescribed fire will be utilized to manage fire adapted and dependent communities, prairie and other early successional restoration sites, and shortleaf pine restoration sites.
VEG-6: Oak and hickory regeneration will be gradually established in the understory of target communities to ensure the long-term retention of oak-hickory forests.
VEG-7: Where appropriate, shortleaf pine will be re-introduced as a forest component. This species holds significant ecological importance to the region and has been reduced in abundance due to past land-use.
VEG-8: Plants that are state or federally listed will be managed according to a recovery plan, or in a manner that helps promote the sustainability and proliferation of the species. See current list of these species in Chapter IV.

Wildlife - Existing Conditions

Overall, management of nature preserves focuses on the perpetuation of healthy natural communities including a natural distribution of fauna, while avoiding the manipulation of vegetation for the sole benefit of a single species. The suitability of an area for a given species of wildlife is a function of the presence of essential resources. These resources include food, water, cover, and space. Forestland is inherently dynamic and disturbances over time cause changes in vegetation composition, structure, and distribution. This process of change, referred to as succession, is what provides a variety of habitat components varying in spatial arrangement, size and development stage. The presence and distribution of diverse fauna and habitat components can be positively influenced by land management activities. Where nature preserves are disjointed, NRS will work to improved habitat connectivity through acquisition, neighbor engagement, and involvement in municipal planning that encourages habitat travel corridors.

The North Carolina Wildlife Action Plan (NCWAP) defines several forest types as conservation priorities that may be enhanced or protected through management activities. Several of these forest types, including early successional habitat, riparian zones, and fire adapted ecosystems, are present in Mecklenburg County Nature Preserves; however, much of the nature preserve property across all

natural communities could currently be classified as mid-successional with very little in-stand structure diversity.

The management of wildlife throughout nature preserves is conducted by NRS staff through landscape-level management activities that benefits communities instead of individual species. When necessary however, NRS occasionally partners with The North Carolina Wildlife Resources Commission (NCWRC) to assist with over-populated or nuisance species, or to monitor the health of specific wildlife species. Organized hunts administered through the NCWRC by permit on specified dates is the only hunting allowed on any preserve. Recreational fishing from the Catawba River shoreline and from most preserve ponds is allowed with a state license.

Wildlife - Goals and Desired Conditions

WLD-1: A variety of successional stages across all natural communities will exist throughout nature preserves, the extent and proximity of which will adequately support a diverse assemblage of native vertebrates and non-vertebrates.
WLD-2: Habitat for all federal and state-listed threatened or endangered species, as well as federal and state-listed species of concern that have been identified on preserves will be protected and managed to sustain and expand their populations throughout the natural communities in which they are currently present per their recovery plan, if applicable.
WLD-3: Habitat will be managed to produce an abundance of diverse native food sources.
WLD-4: Habitat components that are currently lacking throughout NPs, including those associated with both early (grassland and pine-dominated forests) and late successional (Oak-Hickory) forestland will be present and supported through management.
WLD-5: Nature preserves will provide diverse, high-quality habitat maintained through sound scientific land management practices. Habitat will be natural and free of artificial or man-made structures such as nest boxes and water dams unless deemed necessary by a species recovery plan.

Theme 2: Gather Information to fill Knowledge Gaps of Mecklenburg County Resources- This theme discusses areas where information about local natural resources and/or their management is largely unknown and outlines how information about those areas will be gathered.

Information Gaps – Existing Conditions

NRS has collected baseline natural resources information across the County for decades. As such, significant information is available regarding many of our resources including: forests (trees), invasive species, rare species, incidental wildlife occurrences, flora and fauna lists by property, and encroachment threats. NRS also manages an herbarium of 45,000 preserved plant specimens from the North and South Carolina Piedmont, as well as a lab housing wet and dry preserved animal specimens. These collections are continuously accessioned with new specimens.

NRS conducts some internal studies, and hosts academic institutions for applicable outside research. Recent or ongoing studies include: fire effects on natural communities and invasive species, impacts of timber management on small mammals, birds, and insects, and impacts of stream restoration on plants and herpetofauna. Baseline inventory continues for moths and bats. Emerging technology including acoustic monitors, UAVS, advanced LiDAR, and even improved camera-traps will continue to change how data is collected and what is possible to discern. These new techniques and datasets should be used carefully in conjunction with historic field techniques to fill knowledge gaps.

Information Gaps – Goals and Desired Conditions
INF-1: NRS will maintain, and make publicly available, information regarding flora and fauna inventory. Information for sensitive species may be limited to research inquiries, and may not be made available to the general public. Appropriate reference documentation will be curated at the CBS (specimen, photo, digital acoustic file, etc.).
INF-2: Questions regarding local impacts from management or management needs will be answered through peer-reviewed scientific literature review, or internal/external research.
INF-3: Healthy, diverse forests will be resilient to climate change as a result of sound, science-based land management activities.

Theme 3 - Conserving Soil and Water-This theme describes the current conditions of soil and aquatic resources throughout nature preserves, and outlines desired future conditions related to soil conservation and water quality.

Soil and Water- Existing Conditions
According to the Mecklenburg County Soil Survey, the county is "characterized by broad, gently rolling inter-stream areas and by steeper slopes along the drainage ways. No prominent hills stand out above the generally level uplands" (USGS, 1980). The 2012 County LiDAR data shows the highest point in the county is at 878 feet above sea level and is just north of RibbonWalk Nature Preserve. The lowest point is 520 feet (excluding mining operations) between Big Rock Nature Preserve and the state line with South Carolina. Within nature preserves, the highest point is in Clarks Creek NP and the lowest is in Big Rock NP.

Most of the soils found in county nature preserves consist of Cecil soils, which are described as well drained soils that have predominately clayey subsoil formed in residuum from acid igneous and metamorphic rock. Oak-hickory forests typical of Mecklenburg County nature preserves are often found on this general class of soil. Iredell-Mecklenburg Complex is comprised of moderately well drained soils that have predominately clayey subsoil, formed in residuum from diorite, gabbro, and other rock high in ferromagnesian minerals (USGS 1980). Most of the piedmont prairie relicts and hardpan forests exist on these soils.

Because ground disturbing activities can lead to a host of problems including erosion, water quality issues, and vulnerability to invasive species, it is imperative that ground disturbance is limited to only the most urgent management needs. Fireline and trail construction should be minimized and constructed with water quality in mind and in accordance with the North Carolina Forestry Best Management Practices or North Carolina Environmental Quality Best Management Practices (BMPs) (NCDFR, 2006).

Habitat degradation from non-point source pollution including sedimentation and nutrient enrichment due to urbanization, development, road construction, and agriculture is considered the most widespread problem throughout the basin. Because drinking water for the greater Charlotte area is supplied by Mountain Island Lake (Catawba River), efforts to protect the land surrounding the lake have been made through land acquisition. Some of the properties in the nature preserve system were purchased with funds from the Land and Water Conservation Fund (LWCF) and management direction must adhere to the policies dictated from the LWCF Act. "Critical Watershed" is defined by the North Carolina Department of Environmental Quality as *land within one-half mile upstream and draining to a*

river intake or within one-half mile and draining to the normal pool elevation of water supply reservoirs. Many of the preserves in the system fall into the Catawba River Critical Watershed and acquisition for preserves along the Catawba River will always be a priority for this reason (see Appendix A).

Mecklenburg County adheres to Surface Water Improvement and Management (SWIM) buffer regulations to protect and improve water quality. Fauna within the creeks and streams of nature preserves fall under the jurisdiction of LUESA. Several listed aquatic species may be found in nature preserve waterways and NRS's responsibility is to adhere to regulations regarding permitting and management, as well as to manage the surrounding terrestrial environment to protect these waterways and the flora and fauna that thrive in them.

Soil & Water - Goals and Desired Conditions
SWF-1: Riparian areas will contain a natural assemblage of vegetation and coarse woody debris, sufficient to maintain stream hydrologic function and aquatic habitat. Riparian areas will effectively filter sediment from roads and trails and provide important wildlife corridors.
SWF-2: All preserve roads and trails will remain stable with proper alignment, appropriate materials and adequate water control structures in place to prevent accelerated erosion and stream sedimentation.
SWF-3: Road and trail crossings will be designed and implemented in a manner that prevents sedimentation, and does not alter the hydrologic function of the watercourse. Crossings will permit the passage of fish and other aquatic organisms.
SWF-4: Pond dam structures are not natural and may be eliminated or restored to wetland as appropriate. Ponds that remain will be maintained for safety as needed. See GIS layer for data on each pond.

Chapter 3: Resource Management Objectives

The management objectives listed below are operational targets NRS staff will work to achieve with both in-house staff and contracts. These objectives are time specific tasks designed to accomplish our stated goals, and to gradually move towards the desired future conditions for each specific resource. Time schedules and management approaches may be adjusted based on funding limitations, availability of personnel, and other unforeseen factors. Though it is intended that this planning document be dynamic and adaptable over time, the planning period to address the following objectives is limited to 10 years (2017-2027).

I. General Resource Management Approaches

Restoration projects will be initiated where past land-use has resulted in the degradation of resources. Maintenance of natural communities is on-going where resources are intact and healthy.

Mecklenburg County Nature Preserves are a popular destination with an estimated annual visitor load of more than 1.1 million people. By comparison, the most heavily visited national park, The Great Smoky Mountains (GSMNP), sees 10 times the visitation but is 70 times larger. Thus, balancing public access with ecological integrity is challenging on land that is 7 times more crowded than the most visited national park.

All nature preserves except Cowan's Ford Wildlife Refuge are generally open to the public from sunrise to sunset, unless otherwise posted as "closed". The Refuge is a limited-access property and access beyond the main road is by permit only. Individual nature preserves have a range of amenities including

trails, parking lots, shelters, playgrounds, and nature centers. These amenities, and even preserves without infrastructure, are high-volume host locations for multiple uses. The safety of the residents and guests who use preserves must be considered when planning management activities. Patrons may also wish to voice an opinion about management methods or objectives. These opinions should inform outreach needs for the department and may help focus the science-based management approach.

Land acquisition will continue to be a critical objective to ensure ample preservation and access to natural resources for generations to come. As of 2017, approximately 2% of the county land base was designated as nature preserve, or 300ft^2 per resident. This is significantly lower than most other urban areas, according to a USGS Protected Areas Gap Analysis (USGS 2016). Land preservation is particularly urgent in Mecklenburg County due to a 12.5% population growth every 5 years, per the U.S. Census. To retain the same ratio of nature preserve to resident, Mecklenburg County must acquire an additional 3200 protected acres by 2030, at which time the County will be fully developed (Meentemeyer et al, 2013).

Supplemental land is beneficial for all nature preserves, particularly when it serves as a buffer for high quality natural areas, provides habitat corridors, and connects areas of high biological integrity. Acquisition to protect high quality natural areas that may not be adjacent to existing nature preserve is also a goal for the protection and promotion of conservation and biological diversity. However, habitat corridors that connect larger parcels of natural areas are considered the most beneficial to nature preserves and natural resources. As such, additional greenway parcels serve as an ideal complement to nature preserve acquisition when they connect preserves and remain largely undeveloped except for the paved trail.

II. Preserve-Level Objectives

1. Enhance and maintain the ecological value and natural resilience of natural communities while deriving desired resources, including recreation opportunities, healthy wildlife populations, and ecosystem services.
2. Monitor and pursue parcel acquisitions to enhance or buffer existing nature preserves and to preserve high quality, high-potential, or rare ecosystems.
3. Ensure annually that a management plan is written and in compliance for each nature preserve in the NC Dedicated Nature Preserve System, as well as those affected by funding restrictions from the Clean Water Management Trust Fund.
4. Fulfill the terms of the Articles of Dedication with the North Carolina Natural Heritage Program regarding the maintenance of Mecklenburg County's State Dedicated Nature Preserves.
5. Review properties with conservation easements and leases to ensure compliance for these properties.
6. Evaluate the efficacy of management by how it contributes to landscape-scale biodiversity, wildlife habitat connectivity, rare species, and watershed health.
7. Demonstrate the use of a variety of management techniques and protection priorities for public education.
8. Maintain the infrastructure of roads and trails to protect natural resources while allowing access for management activities, recreation, fire control, emergency response, and handicap access.
9. Make available research opportunities to the scientific and education communities.
10. Accommodate training and/or educational exercises for military personnel, state agencies, educational institutions, law enforcement groups, non-profits, volunteers and other entities as suitable by mission.

III. Vegetation and Wildlife Objectives

Vegetation and wildlife objectives are combined since wildlife habitat depends largely on the structure and composition of the vegetation within each natural community.

1. Continue subsequent rounds of continuous forest assessment plots. Use existing plots to develop any new sub-sample areas for additional baseline forest health data, if needed.
2. Continue annual monitoring and management of rare species as indicated by recovery plans. (*See Ch 4, I-A*).
3. Update GIS layer concerning stand specific age-classes throughout all preserves within the first year of new acquisition, or if stand replacement management occurs.
4. Plan and conduct restoration timber operations in low quality forests to increase groundcover, seral stage, and stand structure diversity. Timber operations should push communities to pine/oak/hickory forests and target at least 70 acres (1%) every five years until community goals are achieved.
5. Identify loblolly pine plantations and develop plans for each, favoring conversion to shortleaf pine communities or lower stocking densities to encourage diversity increases where possible.
6. Plan and conduct prescribed burns on 6-10% of preserve acres per year, varying seasons when possible.
7. Conduct prescribed fire treatment of non-native invasive plant species on at least 10 acres of nature preserve annually. Restoration areas, including reforested, burned or logged sites, should be prioritized for treatment when possible.
8. Restore agricultural fields to native species where appropriate.
9. Continue to monitor deer herd health through coordination with NC Wildlife Resources Commission and actively manage herd levels through permit-based hunts.
10. Respond to new occurrences of invasive animal species such as feral pigs according to best management practices.

IV. Soil and Water Objectives

1. Work with City and County Storm Water Services to assess ponds and dam structures for wetland restoration opportunities. Prioritize ponds that fall within Charlotte city limits.
2. Work with USFWS and NCWRC to facilitate Carolina heelsplitter (*Lasmigona decorata*) habitat restoration in Stevens Creek and any other relevant creeks in Mecklenburg County.
3. Coordinate with department planners and utilities to avoid temporary and permanent impacts in and near sensitive natural communities, Critical Watersheds and Protected Watersheds.
4. Annually inspect road and trail stream crossings regarding the stability of those crossings, and the potential for water quality degradation as a result of their condition. Poorly functioning crossings should be stabilized or replaced with a more appropriate structure (i.e. replacing culverts with bridges or low water crossings). Stream crossings posing an imminent threat to water quality will be the highest priorities for improvement.
5. Adhere to County SWIM buffer policies and state BMP guidelines.

V. Recreation Objectives

Outdoor recreational use is an integral part of the Division's mission to raise awareness and appreciation of the natural resources within nature preserves thereby serving as a means by which to protect these resources for future generations. Activities that require development of structures or paved surfaces (playgrounds, climbing walls, etc.) should be minimized and be concentrated in high impact

development zones near the front of a property, or in a way that minimizes development and construction of impervious surfaces.

There are over 60 miles of official trails throughout the nature preserve system. Of these, over half are passable by trucks or UTV. The remaining 30 miles of trail are 5 feet wide or narrower. Because trail alignment can have significant impacts on natural communities or sensitive species, and installation and maintenance can impact soil and water quality resources, planning and maintenance is a significant concern of NRS.

Nature preserve trails serve both as a recreational destination and as connectors. Long term MCPRK goals include increased connectivity between greenways, nature preserves, and local neighborhoods. In the future, certain trails will need to welcome cyclists and other alternative-transports in a sustainable manner as part of a locally connected trail network. Outside of this connective network, most nature preserve trails will continue to serve pedestrian traffic only.

1. Plan and align trails to minimize impacts to natural communities and sensitive species. Avoid building trails or structures in the SWIM buffer, and relocate trails currently in the SWIM buffer.
2. Install and maintain trails in accordance with standard trail guidelines such as the National Park Service's *Handbook for Trail Design and Construction and Maintenance* or the USDA *Trail Construction and Maintenance Notebook*.
3. Annually inspect preserve trails to assess the need for stabilization work, rerouting, or closure. Trails or trail features such as stream crossings posing an imminent threat to water quality due to accelerated erosion and associated sedimentation will be the highest priorities for improvement. *(See Chapter 3, Section IV-4,5).*
4. Implement inclement weather plan for horse trails and monitor trail conditions regularly for impacts from plant foraging, seed dispersal, and high intensity impacts from their hooves, especially in wet conditions.
5. Annually inspect lake and pond shorelines for impacts from recreation. Designate and rotate areas for recreation access including fishing as needed.
6. Maintain awareness of off-trail recreation trends such as Geo-caching, Pokemon-Go, Orienteering, etc. When necessary for resource protection or public safety, restrict these activities to designated areas or seasons.

VI. Property Management and Facility Objectives

1. Continue efforts to mark and maintain boundaries of nature preserves according to NRS Property Boundary Marking Policy & Procedures to ensure protection against litigation, trespass, and poaching (NRS 2014). It is imperative that lands within the county's management authority are surveyed and boundary marked upon acquisition per legal survey. Because several thousand feet may fall between boundary corners, boundary paint and signs along the line are helpful for both managers and adjacent landowners. Well maintained boundary line can save the county money as well protect the county from litigation and legal issues such as trespass, poaching and encroachment.
2. Conduct annual walkthroughs of each preserve or otherwise maintain staff familiarity with the property to facilitate management and identify areas of concern (trespass, encroachment, dumping, poaching, etc.) that should be proactively addressed.
3. Work in partnership with other sections to identify and demolish abandoned structures and facilitate natural community restoration in those places. Timing of demolition should be planned

to minimize impacts to natural resources. Exceptions may be made for structures of notable historic and interpretive value.

4. Work in partnership with other sections, advisory council and departments on capital improvement projects to minimize impacts of new facilities on natural resources, including a maximum percentage for development on each nature preserve to be included in Master Plan documents.

VII. Research, Demonstration, and Education Objectives

1. Develop a research management plan to outline needs for research and track continuing projects. Projects will focus on guiding or evaluating resource management.
2. Actively seek opportunities for partnerships and collaborations with academic institutions, agencies, and other organizations which support the needs of the research management plan.
3. Continue to inventory flora and fauna to fill information gaps.
4. Promote the use and analysis of current datasets collected by NR staff (e.g. forest assessment) by making the data readily available to share and partnering with outside researchers when possible.
5. Continue to maintain permitting documents (internal and external) and collect data resulting from research conducted by outside groups on nature preserves.
6. Develop demonstration plots to help educate the public regarding natural communities and their management.
7. Develop information panels or signage to post in areas where major restoration efforts occur or where Environmental Education programs can be conducted to interpret restoration.
8. Collaborate with Environmental Education and Outdoor Recreation to ensure communication to the public regarding the value of land and natural resource protection, as well as the importance of land management in nature preserves.

VIII. Volunteer Objectives

1. Allocate and administer a seasonal position to lead youth and adult volunteers in Natural Resource-focused projects on a regular basis.
2. Engage volunteers to lessen NRS workload in herbarium and with invasive species treatments, trail work, etc.
3. Use Master Naturalists, Trail Masters, Park Ambassadors, and other volunteers with similar training and buy-in when possible.

Chapter 4: Special Management Considerations

I. Unique & Rare Resources

A. Significant Natural Communities as Designated by NC Natural Heritage Program

The Natural Communities listed in the table below are based on the Guide to the Natural Communities of North Carolina Fourth Approximation by Michael Schafale of the North Carolina Natural Heritage Program (NCNHP). The Guide uses a decades-long dataset from the Carolina Vegetation Survey, along with plant inventory data from the NCNHP county-level inventories, as a basis for the NC communities classification in the CNCNC.

The natural communities found in nature preserves have many challenges regarding their integrity and proposed management. Because they do not follow clear biophysical lines, and because most

communities suffer from the same ailments, management conducted on NPs is most often applied across the landscape to mimic natural disturbance, to maximize efficiency, and to take advantage of pre-existing management compartments following roads, firelines, creeks, etc. See Appendix B for a list of natural community types found in Mecklenburg County Nature Preserves. Because natural communities are all gradients, it is difficult to map specific areas of each, and in some cases the broadest example of the community is listed due to the complexities of identifying some of the more specific communities.

B. Threatened and Endangered Species

NRS cooperates with US Fish and Wildlife Service regarding species that are federally listed by fulfilling the inventory and monitoring requirements of their recovery plan. NRS also prioritizes management of areas containing listed species to ensure habitat requirements are met and the population remains stable or improves. Several of the populations of these species found on nature preserves are the results of mitigation projects resulting from the NC Department of Transportation (NCDOT) or other public infrastructure projects that impacted the natural population. Management and monitoring protocols and techniques of mitigated populations are the same as for natural populations.

NRS also cooperates with North Carolina's Natural Heritage Program (NCNHP), a conservation information clearinghouse, through data sharing of significant natural areas in the County. Mecklenburg County works with NCNHP to protect the significant natural areas in the county. There are four categories designated by NCNHP in which NRS actively participates: Element Occurrences, Managed Areas, Significant Natural Heritage Areas, and Dedicated Nature Preserves.

Mecklenburg County contains several state and federally-listed species, many of which occur on nature preserves. Because NR manages for species diversity, these as well as other rare species receive special consideration. As of 2017, NCNHP lists the following state and federally-listed species known to occur within Mecklenburg County (*see NCNHP for definitions*):

Taxonomic Group	Scientific Name	Common Name	Federal	State	Status	On NP
Vascular Plant	Echinacea laevigata	Smooth Coneflower	E	E	Current	Yes
Vascular Plant	Helianthus schweinitzii	Schweinitz's Sunflower	E	E	Current	Yes
Freshwater Bivalve	Lasmigona decorata	Carolina Heelsplitter	E	E	Current	
Vascular Plant	Rhus michauxii	Michaux's Sumac	E	E	Current	
Sawfly, Wasp, Bee, or Ant	Bombus affinis	Rusty-patched Bumble Bee	E	SR	Historical	
Bird	Haliaeetus leucocephalus	Bald Eagle	BGPA	T	Current	Yes
Vascular Plant	Symphyotrichum georgianum	Georgia Aster	C	T	Current	Yes
Freshwater Bivalve	Villosa vaughaniana	Carolina Creekshell	FSC	E	Current	
Freshwater Fish	Carpiodes sp. cf. velifer	Atlantic Highfin Carpsucker	FSC	SC	Historical	
Freshwater Fish	Etheostoma collis	Carolina Darter	FSC	SC	Current	
Freshwater Bivalve	Villosa constricta	Notched Rainbow	FSC	SC	Current	
Vascular Plant	Eurybia mirabilis	Piedmont Aster	FSC	SR-T	Current	Yes
Dragonfly or Damselfly	Ophiogomphus incurvatus	Appalachian Snaketail	FSC	W2	Current	
Freshwater Bivalve	Elliptio producta	Atlantic Spike	FSC	W3,W5	Current	
Vascular Plant	Tsuga caroliniana	Carolina Hemlock	FSC	W5	Historical	
Vascular Plant	Anemone berlandieri	Southern Anemone		E	Historical	
Vascular Plant	Anemone caroliniana	Prairie Anemone		E	Current	
Vascular Plant	Cirsium carolinianum	Carolina Thistle		E	Current	
Vascular Plant	Delphinium exaltatum	Tall Larkspur		E	Historical	
Bird	Falco peregrinus anatum	American Peregrine Falcon		E	Current	
Mammal	Condylura cristata pop. 1	Star-nosed Mole - Coastal Plain		SC	Historical	
Reptile	Crotalus horridus	Timber Rattlesnake		SC	Current	
Mammal	Lasiurus intermedius floridanus	Florida Yellow Bat		SC	Current	
Mammal	Peromyscus polionotus	Oldfield Deermouse		SC	Current	Yes
Bird	Lanius ludovicianus	Loggerhead Shrike		SC	Current	
Vascular Plant	Desmodium sessilifolium	Sessile Tick-trefoil		SC-H	Historical	
Vascular Plant	Acmispon helleri	Carolina Birdfoot-trefoil		SC-V	Current	Yes
Vascular Plant	Cardamine dissecta	Dissected Toothwort		SC-V	Current	Yes
Vascular Plant	Collinsonia tuberosa	Piedmont Horsebalm		SC-V	Current	
Vascular Plant	Monotropsis odorata	Sweet Pinesap		SC-V	Current	Yes
Vascular Plant	Sceptridium jenmanii	Alabama Grape-fern		SC-V	Historical	
Vascular Plant	Primula meadia	Shooting-star		T	Historical	
Vascular Plant	Silphium perfoliatum	Northern Cup-plant		T	Current	Yes
Freshwater Bivalve	Strophitus undulatus	Creeper		T	Current	
Vascular Plant	Tradescantia virginiana	Virginia Spiderwort		T	Current	

II. Natural Threats and Challenges

A. Invasive Species, Insects, Disease and Potential Pests

Outside of habitat loss in Mecklenburg County, non-native invasive species are the primary threat to our natural resources. The National Invasive Species Council defines an invasive species as a "species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health". Hundreds of invasive species currently exist in the US, and new invaders are found every year. These species can be plant or animal, and some pose more of a threat than others. Some, such as Asian tiger mosquito and armadillo, may have minor impacts on natural resources but are significant because they potentially threaten public health. Other new arrivals like coyote and groundsel tree are native to the U.S., but may be expanding into new areas because of lacking natural predators or land use changes.

Mecklenburg County's most problematic species are plants. According to forest assessment data, autumn olive (*Elaeagnus umbellata*) is documented on 65% of NP land, Japanese honeysuckle (*Lonicera japonica*) on 60%, Chinese privet (*Ligustrum sinense*) on 25%, and Japanese stiltgrass (*Microstegium vimineum*) on 24%. As of 2017, 84% of nature preserve acreage is impacted by at least one invasive species.

The threat for new invasive species in Mecklenburg County is constant, and therefore any plan to combat these plants must be fluid and adaptable. Autumn olive covers the most NP land and has the biggest impact on the natural environment due to its dense coverage that shades out native species. Its habitat requirements are minimal and it can be found in most of the local natural communities.

It is the goal of NRS to treat at least 10% each year of the area affected by invasive plant species. This can be accomplished using herbicide, mechanical treatment, or fire. Planning for invasive species management can vary widely each year due to the fluidity of volunteer groups and seasonal employees who may spend time on chemical treatment, as this approach is very demanding on field labor. However, most years, NRS spends approximately $6000 on herbicide and surfactant for this purpose. Contract labor for invasive species averages approximately $500/acre and would require approximately $324,000 per year to treat 10 percent of infested acreage.

Where possible, fire is used as the initial treatment for invasive species. Using prescribed fire is cheaper and much more cost and time effective than chemical treatment, as the high temperatures girdle the stems and consume the seed bank for some species. However, this approach does not kill most individuals but does top-kill plants, making subsequent chemical application more time and cost efficient.

North Carolina has been under a federal firewood quarantine for years to slow the progression of some invasive pests and diseases. NPNR enforces the prohibition of untreated firewood movement in its McDowell NP campground. Target pests threatening forest health in Mecklenburg County Nature Preserves include but are not limited to emerald ash borer, thousand cankers disease and laurel wilt. Fire ants are also increasing in numbers due to movement of agricultural products and already have a presence on many nature preserves, especially in early successional areas.

B. Climate Change and Forest Management

Across the southeast in general, extreme weather events and increased disturbance such as drought, wildfire, insects, non-native species and carbon release from increased tree mortality will causes rapid change in forest structure across the landscape. Larger and more intense fires are especially concerning in the Wildland Urban Interface (WUI) where nature meets development. North Carolina has the highest level of WUI in the United States, and wildfire acreage could increase 2 to 6 times by 2100, and lightning-ignited wildfires are projected to increase 34% in the next 40 years in the southeast (Stewart, 2006) (Joyce et al 2014).

Climate change will likely reduce the ecosystem services, such as clean air and clean water, that Mecklenburg County nature preserves provide (Joyce et al 2014). The adaptability of natural resource managers and prevailing outlook of politicians and the public will determine how resilient Mecklenburg County's natural communities can be. Social, organizational and economic conditions will determine in large part how effective land managers, including NRS, are in reacting to climate change impacts.

In the short term, NRS is preparing for weather changes by maintaining and managing sustainable preserve roads and trails, and upsizing culverts for projected stream flow increases. While it is already practiced on nature preserves, retaining beavers in park stream systems can help to retain cooler water upstream and protect aquatic life, as well as to reduce water velocity after storms, thus reducing soil erosion and sedimentation. Meeting prescribed burning goals will be critical to maintaining resilient forests and reducing the public safety threat of wildfire. NRS will continue sustainable forest management practices such as diversifying species, mixing age classes, and increasing thinning to safeguard forests, with some minor finetuning to account for climate change.

III. Land-use Restrictions and Allowances

A. Deeded Use Restrictions (Conservation Easements)

Many nature preserve tracts are subject to deed restrictions. These perpetual restrictions are site specific and must be carefully reviewed to ensure compliance. Permanent conservation easements are the most common. These easements tend to restrict site disturbance and development, and may include reporting requirements. Some easements are monitored annually by the easement holder. Others may require that a management plan be in place, such as properties purchased with funding from the NC Clean Water Management Trust Fund (CWMTF) or those designated as State Dedicated preserves.

Preserve	Origin	Deed	Plat	Held By	Reporting/ Mgmt Plan
Clarks Creek	Stream Restoration	Bk 25907, Pg 153	Bk 52, Pg 585	State of NC	
Evergreen	Stream Restoration	Bk 25343, Pg 580		City of CLT	
Gar Creek	Pre-existing	Bk 11775, Pg 668		Catawba LC	
Gar Creek	Pre-existing	Bk 11851, Pg 641		Catawba LC	
Gar Creek	Pre-existing	Bk 12239, Pg 1		Catawba LC	
Gar Creek	Pre-existing	Bk 13634, Pg 410		Catawba LC	
Gar Creek	Pre-existing	Bk 11813, Pg 270		Catawba LC	
Gar Creek	Pre-existing	Bk 18596, Pg 714		Catawba LC	
Gar Creek	Pre-existing	Bk 16753, Pg 198		Catawba LC	

Haymarket	NC CWMTF	Bk 16113, Pg 172	Bk 40, Pg 49	State of NC	Yes
McDowell	State Dedication	Bk 25569, Pg 632	Bk 49, Pg 547	State of NC	Yes
Reedy Creek	Stream Restoration	Bk 31063, Pg 274		City of CLT	
Rocky River Bluff	Pre-existing	BK 14212, Pg 913		Davidson LC	

B. Land Acquisition Funding Restrictions

The county has received funding from the Land and Water Conservation Fund (LWCF) for acquisition of lands for the nature preserve system. The provision of LWCF funds requires strict adherence to Section 6 (f) (3) of the Land and Water Conservation Fund Act. This section of the Act states that without the consent of the Secretary of Interior, no property acquired or developed with assistance of LWCF funds shall be converted to purposes other than outdoor recreation. Lands within the nature preserve system acquired with LWCF funds are to be considered nature preserves in perpetuity, and include McDowell, Latta Plantation, and Reedy Creek Nature Preserves.

C. Leases

Certain parcels managed as Nature Preserve are owned by the City of Charlotte and leased to Mecklenburg County to operate as nature preserve. Parcels 1316101 and 1316103 at Stephens Road Nature Preserve and parcel 1303218 at Auten Nature Preserve are owned by the City of Charlotte. A conservation and preservation agreement recorded in December of 1994 for these properties states that all management responsibilities and costs are the responsibility of the County. The lease shall remain in effect until both the City and County agree to dissolve it (see agreement in Appendix C).

Outside organizations have long-term leases or contracts with Mecklenburg County on nature preserve land in several instances. (See lease agreements in Appendix D).

- Catawba Valley Scottish Society leases 250 acres of Rural Hill Nature Preserve. The lease allows most activities, including development, as long as it meets the mission of the leasing organization and Division.
- Carolina Raptor Center (CRC) has leased 57.5 acres at Latta Plantation since 1986. The agreement requires that CRC abide by all park ordinances, shall mitigate “run-off”, and shall not disturb natural areas or remove trees without prior consent of the County.
- Historic Latta Plantation leases 52 acres for a living history farm, and agreement requirements are similar to that of CRC’s.
- TarHeel Trailblazers maintain a performance agreement to maintain all mountain biking trails at Sherman Branch Nature Preserve.

D. Utilities and Access Easements

Power lines operated by Duke Energy and Energy United, natural gas lines by Piedmont Natural Gas (now part of Duke Energy), high pressure gas lines by Colonial Pipeline, and/or Charlotte Water sewer and water lines exist on nature preserve properties. NRS cooperates with these utilities with regard to management activities that may impact their operation, as well as access or easement issues, and the utilities cooperate with NRS regarding location of lines, timing of maintenance, rehabilitation ground cover species selection etc. These corridors are essentially linear facilities, and such development fragments natural areas. Any future utility corridors should be avoided in nature preserves if possible, but should be located in previously disturbed areas and away from ecologically sensitive sites if constructed.

On county nature preserves, the following utility corridors exist: Duke Energy has 250' transmission lines as well as smaller distribution lines on several nature preserves; Energy United maintains 60' above-ground distribution lines; Piedmont Natural Gas maintains underground lines; Colonial Pipeline maintains a 60' underground easement, and Charlotte Water operates both sewer and water lines (see Utility Corridor map).

Various easements for ingress/egress exist on many nature preserve properties. Some are held by the utilities mentioned above but others are pre-existing agreements between private landowners and still exists on many parcel deeds. These tax easements have little consequence on most preserves, however, as most are decades old and are now located entirely within preserve boundaries.

E. Ecological Conservation Areas

While most natural resource management occurs on nature preserves, there are many properties within the park system that include natural areas that warrant protection and management. These areas may fall within Greenways, Community Parks or any other park designation and have had limited impacts from development or encroachment. Ecological Conservation Area (ECA) is an internal designation given to such areas. High quality natural areas or areas providing unusual habitat may be given this designation to recognize it as an area than heeds special consideration with regard to development or capital planning. Once NRS identifies and assesses such areas, an ECA designation is approved by the appropriate park superintendent and perhaps PRC. Once approved, the area is mapped and marked with signs by NRS. Designated areas will be included on all capital planning projects and associated maps. Proactive management will be limited in ECAs and will be largely on an "as needed" basis.

F. Historic and Agricultural Communities

Located within many nature preserves are abandoned fields and/or agricultural lands that have been cultivated for decades or centuries. These areas are comprised largely of non-native species like fescue grass, but while they are not natural communities they do provide value to the natural system by supporting unique biota. This biota, while it adds diversity, is likely artificially overrepresented in the piedmont due to land use changes and disturbance history (Greenberg and Collins, 2015). For this reason, most will be restored to natural communities, but some will be maintained as agricultural fields where appropriate, and will provide opportunities for environmental education and cultural interpretation. Where possible, these fields will be converted to native grasses and forbs, and subsequently maintained through outside contracts (e.g. annual mowing).

Summary Statement

The landscape in and around Mecklenburg County Nature Preserves has been influenced and shaped by thousands of years of ecological and cultural change. The primary focus of this management plan is to provide a foundation for management needs, and develop a systematic procedure to maintain and enhance the ecological, cultural, and economic value of Mecklenburg County's Nature Preserves. This plan has been developed with recognition of the ecological importance of natural resources in Mecklenburg County, and the social and economic importance of these natural resources to the local community. As natural resource professionals, we will approach the management of nature preserves and its natural resources with ethical stewardship and remain adaptive over time in order to protect these resources in perpetuity.

Notes and Acknowledgments: This document was originally completed in 2017. Its purpose is to be a reference for natural resource managers and other interested parties. It should be updated every five years or in conjunction with the Mecklenburg County Park and Recreation Master Plan. The general format and some language in this management plan was structured after similar management plans from the North Carolina Division of Parks and Recreation and North Carolina Forest Service with permission.

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